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TWO NEW SPECIES OF *ERYTHRANTHE* SECT. *MIMULOSMA* (PHRYMACEAE) FROM CALIFORNIA

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ABSTRACT

Erythranthe trinitiensis Nesom, **sp. nov.**, is endemic essentially to the Trinity Alps of northwestern California (Humboldt, Siskyou, and Trinity cos.). It has been identified as *E. pulsiferae* but differs most consistently in corolla color and in having inflated calyces. The two species apparently are closely sympatric at least in some areas. **Erythranthe taylori** Nesom, **sp. nov.**, apparently is narrowly endemic to limestone habitats in northwestern Shasta County. It is distinctive in its petiolate leaves with ovate blades, strongly herkogamous flowers with distinctly 2-lipped corollas, and papillose calyx vestiture.

KEY WORDS: *Erythranthe pulsiferae*, sect. *Mimulosma*, new species, California

Study at CAS-DS, UC-JEPS, and CHSC has led to the recognition of two previously undescribed species of *Erythranthe* in northern California. The first apparently is closely related to *E. pulsiferae* (A. Gray) Nesom, the second apparently more closely to *E. ampliata* (A.L. Grant) Nesom; both new species are placed in *Erythranthe* sect. *Mimulosma* (Barker et al. 2012; Nesom 2012).

ERYTHRANTHE TRINITIENSIS Nesom, **sp. nov.** **TYPE: USA. California.** Trinity Co: wet ground near Hyampon, Jun 1883, *V. Rattan s.n.* (holotype: DS 49216!; isotypes: CAS!, DS-2 sheets!, JEPS 22995!, RSA, UC 125295!).

Similar to *Erythranthe pulsiferae* in its narrow leaves, minutely glandular-puberulent vestiture, and weakly 2-lipped corollas; different in its consistently petiolate leaves, inflated calyx, and pale yellow to light purplish or white corolla limb with pink borders.

Annual herbs. **Stems** erect, simple or branched from the base, 5–15 cm, minutely puberulent with gland-tipped trichomes (glands dark), without other trichomes. **Leaves** mostly cauline, largest at midstem, blades ovate to elliptic-ovate, 6–17 x 4–9 mm, tapered to a narrow petiole 4–8 mm, margins entire or with 1–2 pairs of shallowly dentate-serrate teeth, base attenuate, apex acute, surfaces minutely glandular-puberulent, sometimes sparsley villous-glandular adaxially. **Flowers** 2 per node, chasmogamous. **Fruiting pedicels** 9–17 mm, spreading at 80–30° angles, sometimes slightly arching upward. **Calyx** oblong-ovoid, 8–10 mm, 3.5–5 mm wide (pressed) proximally, sparsely minutely puberulent, distinctly wing-angled, texture even, intercostal area greenish, lobes deltate to triangular, 1–1.5 mm, subequal, erect, margins sparsely ciliate. **Corolla** tube-throat yellow, lobes (limb) pale yellow to light purplish or white, with distinctly pink borders, palate ridges yellow, thoat and ridges weakly red-spotted, floor apparently glabrous, tube-throat 7–10 mm, limb 7–9 mm wide (pressed), weakly 2-lipped. **Anthers** included, glabrous, all at the same level. **Style** glabrous, slightly above level of anthers, exserted 4–5 mm beyond apex of mature calyx. **Capsule** 6–8 mm, included.

Flowering Jun–Jul(–Aug). Seeps over serpentine, wet meadows, roadsides; 1300–2000 m. California (Humboldt, Siskyou, Trinity cos.).

Additional collections examined. **California**. Humboldt Co.: extreme E edge of county, 7.5 air mi SW of Willow Creek, County Rd 7K100, 4.5 mi S of Berry Summit (on Calif. Hwy 299), 1 mi W of Horse Mountain, W-facing serpentine, open with doug fir, incense cedar, ponderosa pine, temporarily moist seep, ca. 4000 ft, 10 Jul 1990, *Spellenberg 10252* (UC 1565790); Horse Mountain, wet or seepy ground, serpentine formation, Jeffrey pine belt, ca. 4800 ft, 20 Jun 1926, *Tracy 7616* (JEPS 80913, UC119678); Grouse Mt., damp generally gravelly slopes, 5000 ft, 25 Jul 1933, *Tracy 12838* (JEPS 80914, UC 582493); Grouse Mt., wet meadowy ground near "Clear Lake," 5000 ft, 30 Aug 1933, *Tracy 13029* (UC 582492). Siskyou Co.: Cabin Meadow, N of Cory Peak, Scott Mts., disturbed soil at edge of road, ca. 6000 ft, 25 Jul 1967, *Parker & Roderick s.n.* (CAS). Trinity Co.: occasional in a meadow on the S side of Mt. Eddy, in the Canadian zone, ca. 6000 ft, 17 Jul 1921, *Heller 13573* (DS).

The holotype (Fig. 1) of *Erythranthe trinitiensis* was annotated by A.L. Grant as "*Mimulus pulsiferae* Gray approaching *M. latidens*." *Parker & Roderick s.n.* (Fig. 2) was tentatively recognized by whoever prepared the label as an undescribed species. And R.J. Meinke in 1987 annotated the type with this: "These plants combine characteristics of *M. pulsiferae* A. Gray, *M. breviflorus* subsp. *robustus* Meinke, and *M. latidens* (A. Gray) Greene. They are unique in combining an inflated fruiting calyx with petiolate leaves and a purple-limbed corolla. This is the only known collection." Others, however, have recorded observations of the distinctive corolla coloration — Spellenberg (*10252*) and Tracy (*7616, 12838*) specifically noted that the limb was pale yellow to white and pink-bordered.

Differences between *Erythranthe trinitiensis* and *E. pulsiferae* are summarized in the following couplet.

1. Corolla lobes yellow; mature calyx oblong-cylindric, (5–)6–9 mm, 3–3.5 mm wide proximally; leaves reduced in size distally or relatively even-sized, basal usually persistent, proximal and midcauline blades narrowly oblanceolate to lanceolate-ovate; petioles 0 or 1–2 mm; flowers plesiogamous to herkogamous, apparently autogamous to weakly allogamous or allogamous ..... **Erythranthe pulsiferae**

1. Corolla lobes pale yellow to light purplish or white, with distinctly pink borders; mature calyx oblong-ovoid, 8–10 mm, 3.5–5 mm wide proximally; leaves largest at midstem, basal usually absent by flowering, proximal and midcauline blades ovate to lanceolate; petioles 4–8 mm; flowers herkogamous, apparently allogamous ..... **Erythranthe trinitiensis**

Plants of the two species apparently grow in close sympatry (examples below for Grouse Mountain and Scott Mountain), indicating that an effective isolating mechanism is in effect. Field studies should be of great interest. Collections of typical *Erythranthe pulsiferae*: Humboldt Co.: Grouse Mt., local in moist places, 4700 ft, 27 Jun 1934, *Parks & Tracy 11087* (JEPS, UC); Grouse Mt., moist, gravelly flat, 5000 ft, *Tracy 12834* (UC). Siskyou Co.: Scott Mountain, dried out seepage area, middle slopes of S exposure, ca. 6200 ft, 2 Sep 1958, *Bacigalupi 6843* (JEPS).

Collections of *Erythranthe trinitiensis* in the vicinity of Horse Mountain (Humboldt Co.) are proximal to the Horse Mountain Botanical Area, a designated management unit of the Six Rivers National Forest conserving serpentine habitats. In a floristic analysis of the region, Scott (2010) reported *Mimulus pulsiferae* as "common in dry meadows ... ." Most of the known stations for *E. trinitiensis* are at sites where the bedrock geology is mapped (Irwin 1994) as peridotite or serpentine, suggesting that the species is an ultramafic endemic.

These plants combine characteristics of M. pulsiferae Gray, M. breviflorus Piper subsp. robustus Meinke, and M. latidens (Gray) Greene. They are unique in combining an inflated fruiting calyx with petiolate leaves and a purple-limbed corolla. This is the only known collection.
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Figure 1. *Erythranthe trinitiensis*, holotype.

Figure 2. *Erythranthe trinitiensis, Parker & Roderick s.n.* (CAS).

Figure 3. *Erythranthe trinitiensis*, flowers from *Parker & Roderick s.n.* (CAS). The pink borders of the corolla limb are evident even in drying. Note mature, inflated calyx at lower right and immediately above.

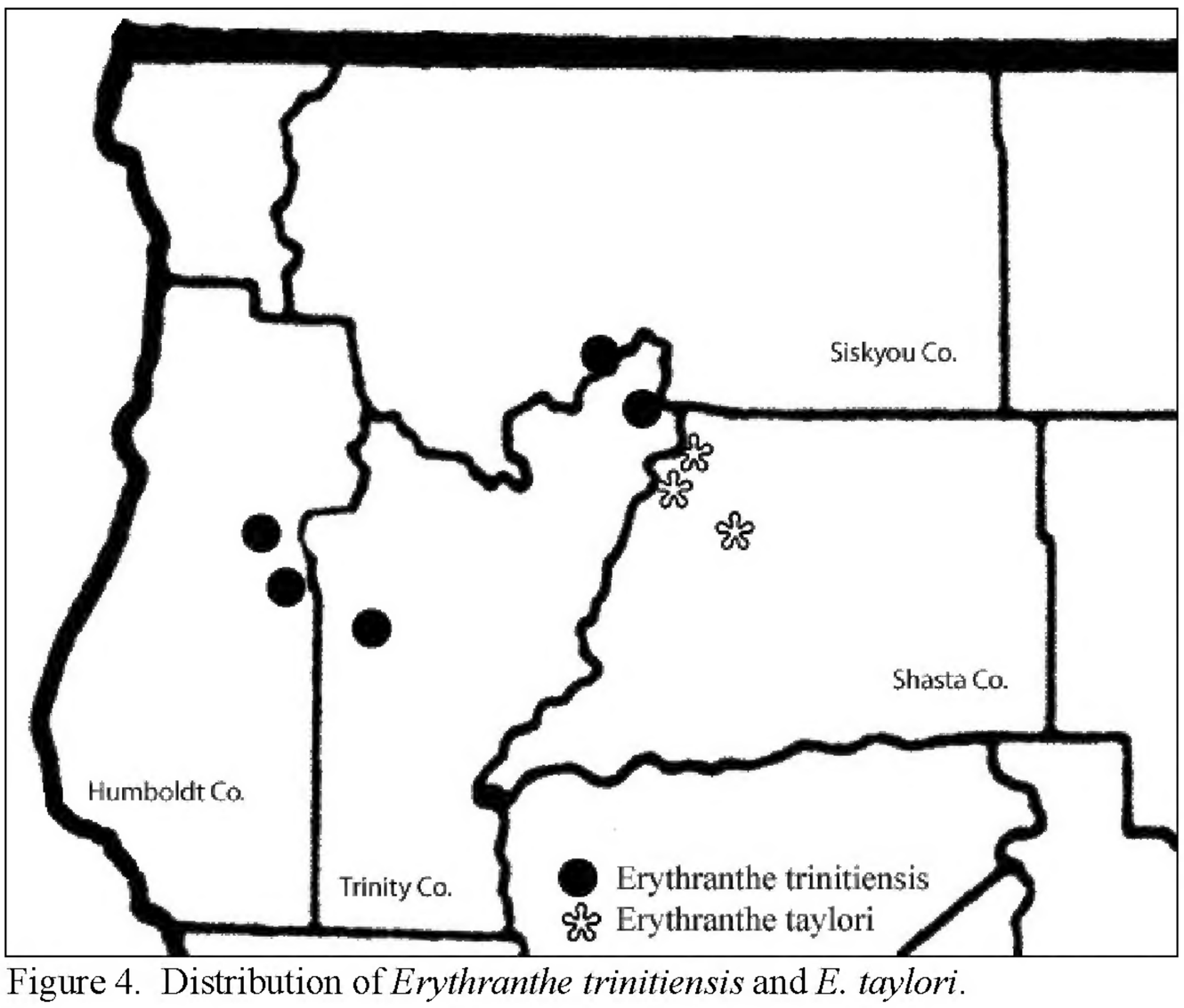

Figure 4. Distribution of *Erythranthe trinitiensis* and *E. taylori*.

ERYTHRANTHE TAYLORI Nesom, **sp. nov.** **TYPE**: **California**. Shasta Co.: Sacramento River Canyon, Hazel Creek drainage, North Fork Hazel Creek (ca. 1.5 mi SW of Castella), rocky S-facing limestone cliffs with sparse cover of *Ceanothus integerrimus*, *Toxicodendron diversilobum*, site bordered by dense mixed conifer-dominated forest, 2800 ft, 30 Apr 1993, *D.W. Taylor 13382* (holotype: UC 1736599; isotype CHSC).

Distinct from *Erythranthe pulsiferae* (A. Gray) Nesom in its larger, ovate leaf blades, smaller calyces with different vestiture, strongly and consistently herkogamous flowers, and corollas more distinctly 2-lipped. Distinct from *E. ampliata* (A.L. Grant) Nesom in its larger, papillose calyces, shorter fruiting pedicels (6–13 mm vs. 10–22 mm), corollas with shorter tube-throats (5–7 mm vs. 8–12(–14) mm, and shorter capsules (3–4 mm vs. 5–6 mm).

Annual herbs from a filiform taproot. **Stems** erect, simple or 3–5-branched from the base, 5–10 cm, sparsely eglandular-villous proximally, becoming sparsely short-stipitate-glandular distally. **Leaves** mostly cauline, basal not persistent, largest at midstem or basal and midstem to nearly even-sized, blades broadly ovate to elliptic-ovate or ovate-lanceolate, mostly 4–20 x 4–12 mm, green above, purple beneath, palmately veined, petioles 3–5(–8) mm, margins with 2–4 pairs of shallow, serrate-dentate teeth, base rounded to truncate, apex rounded to obtuse or acute, surfaces of distal leaves moderately short-stipitate-glandular, vestiture much reduced proximally. **Flowers** 2 per node, chasmogamous. **Fruiting pedicels** 6–13 mm, spreading at 80–30° angles, sometimes slightly arching upward. **Calyces** tubular-campanulate, 4–5 mm, 1.5–2.5 mm wide (pressed) proximally, wing-angled, proximal half between the angles densely invested with tiny, waxy-white, eglandular, papillose trichomes, without other vestiture, lobes shallowly triangular, ca. 1 mm, subequal. **Corollas** (including palate ridges) all yellow, with faint red spots or short lines on throat floor and ceiling, palate ridges sparsely villous, tube-throat 5–7 mm, limb 4–6 mm wide (pressed), distinctly 2-lipped. **Anthers** included, glabrous, all at same level. **Stigma** glabrous, below or at same level as anthers. **Capsules** 3–4 mm, included (extending to base of calyx lobes).

Flowering Apr–May. Crevices in limestone cliff faces and outcrops; 900–1100 m. California (Shasta Co.).

Figure 5. Flowers of *Erythranthe taylori*, from the population of *Taylor 13405*. Photo by Dean Taylor.

Figure 6. *Erythranthe taylori*, from the population of *Taylor 13405*. Photo by Dean Taylor.

Additional collections examined. **California**. Shasta Co.: Hirz Mountain, along trail from parking area to lookout, growing in crevices in limestone rock, 3240 ft, 29 Apr 2010, *Kierstead-Nelson 2010-003* (CHSC 105854!); S end of Gray Rocks, Squaw Creek watershed, Shasta Lake region, limestone outcrops in open forest dominated by *Quercus kelloggii-Pinus sabiniana*, ca. 2800 ft, 1 May 1993, *Taylor 13405* with J.R. Shevock (RSA 565081, UC 1736596!, UCR 84857, CHSC).

Taylor's collections of these plants were identified as *Mimulus pulsiferae*, although he recognized that they were not typical (D.W. Taylor, pers. comm.). Kierstead-Nelson's collection was identified as *Mimulus alsinoides* (Douglas ex Benth.) Nesom & Fraga. These identifications probably were influenced by availability of choices from species occurring in northern California, but the broad, distinctly 2-lipped corolla limbs and ovate leaf blades with palmate venation of *Erythranthe trinitiensis* are similar to those of species of the northern group of sect. *Mimulosma*, the "Columbia River clade" (Whittall et al. 2006) of Oregon, Washington, Idaho, Montana, and Wyoming. It is hypothesized here that E. *trinitiensis* is a geographic outlier of that group, perhaps most closely related to the Idaho endemic *E. ampliata* (AL. Grant) Nesom of the "Snake River clade" (as termed by Whittall et al. 2006).

Figure 7. *Erythranthe taylori*, *Taylor 13405* (paratype, CHSC).

Figure 8. Two views of *Erythranthe taylori* habitat at the locality of *Taylor 13405*. Photos by Dean Taylor.

All three sites for *Erythranthe taylori* are on the Hosselkus Limestone and McCloud Limestone Formations, Upper Triassic fossiliferous marine micritic limestones that outcrop in Plumas and Shasta counties, California. *Ageratina shastensis* (D.W. Taylor & Stebbins) King & H. Rob. (Taylor & Stebbins 1978) and *Neviusia cliftonii* Shevock, Ertter, & D.W. Taylor (Shevock et al. 1992; Taylor et al. 1993) also are almost completely restricted to the Hosselkus Formation, as are a number of animal species (see Cheng 1997 for a good summary of information regarding the geology and associated biology). The type locality of *E. taylori* is located on private timberlands, but the two other known sites are on public lands on the Shasta-Trinity National Forest.

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